International Journal of Clinical Nutrition & Dietetics

Health Beliefs of People with Type 2 Diabetes in Primary Health Care in Muscat, Oman: A Qualitative Approach

Lyutha Al Subhi[1]*, Patricia Kendall[2], Mohammed Al-Shafaee[3] and Samir Al-Adawi[4]

[1]Department of Food Science and Human Nutrition, Sultan Qaboos University, Oman
[2]College of Applied Human Sciences, Colorado State University, USA
[3]Department of Family Medicine & Public Health, College of Medicine and Health Sciences, Sultan Qaboos University, Oman
[4]Department of Behavioral Medicine, College of Medicine and Health Sciences, Sultan Qaboos University, Oman

Abstract

Background: With recent affluence, Oman has witnessed a dramatic increase in the number of Omani nationals with type 2 diabetes. Most national studies have focused on quantifying the magnitude of the problem, and issues related to co-morbidity. The purpose of this study was to explore the health beliefs associated with diabetes self-management among adult Omani patients with type 2 diabetes.

Methods: This study employed the Health Belief Model (HBM) as the theoretical framework. A structured open-ended interview question guide was developed based on the constructs of the HBM and based on literature regarding various factors associated with diabetes management. The study was conducted in seven conveniently selected Primary Health Care (PHC) centers in the Muscat Governorate. In total 29 patients with type 2 diabetes were invited at convenience, while visiting the centers for regular follow ups, to participate and were interviewed based on written consents.

Results: Applying the HBM with this group of patients indicated to six factors as barriers to diabetes self-care: (1) cost of self-monitoring for blood glucose level, (2) social interactions, (3) negative feelings associated with living with the disease, (4) lack of accurate practical and culturally-sensitive health education about diet and exercise, (5) fatalism, and (6) low self-efficacy. Diabetes self-management education was not valued and a large number (19/29) did not actively seek information about diabetes.

Conclusion: The findings here point to the urgent need for a culturally appropriate diabetes education program with respected to the health beliefs indicated here.

Introduction

The health of Omanis has been dramatically affected by the recent affluence in the country. Type 2 diabetes is a growing challenge [1] and Oman, a developing country, is experiencing an epidemic [2]. Diabetes is a costly condition imposing great strain on national economies [3]. Prior to 1990, the prevalence of diabetes in Oman was unknown. 1990 saw the first attempt to quantify the rate of diabetes in Oman in a retrospective study of routine health statistics. Accordingly, the national rate of new cases of diabetes was estimated at 4.8/1000; the rate in the capital city Muscat, was much higher (13.4/1000)[4].

This distinction was confirmed in a national follow-up survey for diabetes in adults ($\geq$ 20 years) (n = 5,096). The prevalence across regions ranged from 7% to 13% for diabetes and 8% to 14% for impaired glucose tolerance (IGT), with a much higher rate in urban areas. Accordingly, a national diabetes control program was implemented in Oman [5]. In 2000 a second national health survey was conducted to reassess the trends. The data demonstrated a drastic increase in the urban regions, with an urban to rural ratio of 235:100 [6].

Clearly the rising tide of diabetes in the country is unremitting. Diabetes self-management is the responsibility of the affected persons who need to be empowered with effective knowledge and skills to strive for better quality of life [7]. Both the biomedical and the psychosocial interventions are needed for effective diabetes management [8]. One crucial factor is the impact of personal social and cultural context on behaviour. Health professionals need to acknowledge health beliefs and traditional customs to secure patient trust and agreement in diabetes management [9]. It is also apparent that a range of socio-cultural beliefs, the personality of the patient, and the quality of interaction between doctor and patient all impact on the extent to which any medical treatment is adhered to[10]. A better understanding of these factors is critical if the quality and effectiveness of diabetes health care in Oman is to be improved.

Most research relevant to diabetes in Oman is focused on prevalence and risk factors aspects of the condition. The use of health theories and models in the Arab region was found to be limited in studies of people with diabetes. The HBM has been used elsewhere to identify factors influencing self-management behaviors among people with type 2 diabetes as well as their educational needs [11-14]. To date, little is known about the health beliefs of individuals living with diabetes. Thus, this explorative study in Oman employed the HMB to elicit insights into the beliefs associated with diabetes self-management in a sample of Omani patients attending Primary Health Care (PHC) centers.

Study Methodology

In this explorative structured qualitative study one-on-one interviews were regarded the best option for assessing the health beliefs of patients with diabetes compared to group interviews (focus groups) following two unsuccessful attempts to conduct focus

*Corresponding Author: Dr. Lyutha Al Subhi, Department of Food Science and Human Nutrition, Sultan Qaboos University, Oman; E-mail: lyutha@squ.edu.om

group sessions: in the first instance only two of 12 recruited patients attended for discussion, while none of the six subjects recruited for a focus group at a second location showed up.

A theoretical framework of the Health Belief Model (HBM) was used in this study. HBM has been found to have heuristic value among different cultural and linguistic groups in understanding behaviour underpinning many chronic illnesses [15, 16]. It is based on six constructs that influence whether individuals will choose to take action to prevent, screen for, and control the health issue at hand. Briefly, these include the person's perceptions regarding their *perceived susceptibility* of developing a certain health problem and the potential *severity* of that health condition. Also included are the perceived benefits in taking action to improve the health outcome, and any *perceived barriers* that may impede taking the recommended behaviors. *Cues to action* are stimulants to take action, while *self-efficacy* refers to how confident and able a person is in executing an action successfully [17]. A structured open-ended interview question guide was developed based on the constructs of the HBM and based on literature [11, 18, 19] regarding various factors associated with diabetes management. Example question related to perceived susceptibility included: We want to know what you think about diabetes complications: Probe: What complications do you think could result from diabetes? Probe: Why would diabetes result in complications? Probe: Do you think you are susceptible to getting any type of diabetes complications? Additional questions captured demographic factors (gender, age, body mass index [BMI]), level of education, employment status, length of time from diagnosis, and previous experience with nutrition education/counseling. The interview guide was reviewed by a panel of experts in the field of diabetes from Oman and Colorado State University (CSU) and adapted as needed. The study was approved by the CSU's Human Research Committee, USA, and the Directorate General of Health Services of the Ministry of Health in Oman.

The study was conducted in seven conveniently, based on traveling distance, selected PHC centers in Muscat Governorate in December 2004 and January 2005, where the majority of people with diabetes are seen for diabetes care. The study targeted Omani adult (≥ 20 years) nationals with type 2 diabetes visiting the PHC centers for their regularly scheduled appointments. Only patients who could fluently communicate in Arabic were selected to eliminate bias and misunderstanding that could result due to language barrier. Patients were targeted once arrived at the waiting area of the clinic. Potential subjects were approached in the waiting room of the diabetes clinics, the objectives of the project were verbally explained, and patients were invited to participate. Written consents were obtained from patients who agreed to participate then data was collected by a 30 to 40 minute one-on-one interview in private in the meeting room at the PHC centers. Interviews were conducted in Arabic by the first author and were audio taped, with additional notes made as needed. The interviews were either conducted before seeing doctors or after depending on the preference of the patient and the waiting time available before seeing the doctors. Initially 30 patients agreed to participate and thus were interviewed (14 males and 16 females). However, one male patients decided to pull out during the interview indicating lack of time to continue.

Audio taped interviews of 29 patients (who completed the interview) were simultaneously translated and transcribed, additional relevant notes taken during the interviews were added. All transcripts were reviewed against the original audio tapes by a separate bilingual dietitian for translation accuracy. Quantitative content analysis was applied to analyze the interview transcripts looking for implicit and explicit occurrence of terms and/or phrases related to the preset concepts based on the HBM and literature. Thus, common concepts were determined based on the frequency of terms/statements relevant to the same idea to capture existence as well as prevalence to indicate importance of concept [20, 21] in the study sample. Interview scripts were then coded for the preset concepts based on HBM and the literature. The HBM constructs were explored in detail and new emerging themes were noted. Categorization of concepts was then applied, putting each concept in one group by aggregating related quotes. Data under each category was reread and revised as seemed appropriate then summaries of qualitative findings were compiled for each question [20]. All transcripts were manually coded to account for semantic and cultural interpretation of the interviews; when needed audio taped interviews were reviewed to confirm meaning and interpretation. Findings were classified into primary and secondary based on frequency of existence. 'Primary findings' consisted of those concepts that appeared in 50% or more of the interviews; 'secondary findings' referred to issues mentioned by 25–49% of the participants. Two researchers separately read the transcripts and highlighted common concepts in the interview scripts. Microsoft Office Word 2007 was only used to organize data into concept categories. Descriptive data were analyzed in Microsoft Excel to determine frequency and mean.

Results

Demographics

A total of 29 diverse patients were interviewed from seven PHC centers. Participants included 13 males and 16 females, with ages ranging from 23 to 67 years. The length of time from diagnosis varied from one month to 19 years (mean of 6.4 years). Twenty-two of the participants had less than a high school education; seven had completed high school or some college and two had Bachelor degrees. About a third of participants (8 males, 2 females) were employed outside the home. Overall, 17 participants reported having seen a dietitian/diet technician in the year prior to interview; on average three counseling sessions had been received. The remainder (12) said they had never met with a dietitian/diet technician.

Perceived threat of diabetes

More than half the subjects (16) indicated that they felt susceptible to diabetes complications, which they associated with elevated blood glucose. The remaining subjects (13) indirectly indicated they did not believe that they had a great chance of developing complications saying, "God gave me the disease, and he shall take care of me," "God knows if I'm susceptible," "No one in my family has any complications," or "I take the medications." Kidney and eye diseases were the only two complications that were largely recognized as possible risks.

With respect to the severity of the threat, all subjects believed that complications could have serious consequences in their lives. Employed subjects mentioned that they might not be able to work due to the increased number of visits to hospitals, which would affect their source of income. Others associated severity with an inability to perform duties and chores, physical and emotional discomfort, and negative impacts on personal relations with spouses. Some foresaw that complications would cause them to be persistently weak, thereby affecting their mobility and ability to eat.

Only 7 participants had been hospitalized in the past due to complications related to diabetes. Most found hospitalization uncomfortable, which increased their worries: "I felt worried, and it made me think a lot." On the other hand, some were unaffected by the experience: "I had no choice; what can I do?" and "I depend on God" were common comments made by these patients.

Perceived benefits of diabetes management

When asked about the benefits they believed they would gain from good diabetes management, patients (20) largely supported the notion that good diabetes management would help them maintain their heath, feel healthy, be energized, and remain free of symptoms. Common comments included: "Blood sugar level will be good and I will feel good, strong and healthy" and "I will not have body aches and repeated urination." Protection from disease complications was mentioned second most frequently (8/29): "I will be able to see and walk around; some people have lost their vision," and "I will have fewer diseases." However, an element of uncertainty associated with the benefit of managing diabetes was revealed: "It could protect against complications, but this is in God's hands also," signifying that their attitude was associated with their religious beliefs. In other words, they were saying that control would protect a person from developing complications if it were not the person's fate to contract such ill health.

Perceived barriers to diabetes management

Most participants (21) did not test their own blood glucose, but relied on the tests received from health services during periodical follow-ups. Cost was seen as a barrier to blood glucose self-monitoring by 15 of those who did not test their own blood glucose. "I don't have a meter and can't afford it," and "I would like to get one but it might be a financial burden." Of those who did test their blood glucose (8), all but one did it only once a week, and cost, again, was the major reason for the infrequent testing: "I only do it once a week because the strips are expensive."

Social interaction was seen as another major factor (16) affecting the ability to effectively manage one's diet. Food is a major aspect of socialization in Oman and subjects with diabetes who refrain from eating certain dishes or who ate minimal amounts received comments from hosts such as, "Maybe you don't like our food". Thus individuals felt forced to eat more. This factor is evident in the following statements made by patients: "I have to eat out of etiquette; the hostess will even serve me more food which is extremely difficult to refuse in our culture," or "Eat and Allah will take care of you."

A third major barrier expressed by 24 participants was the emotional struggle of wanting to be like others who do not have diabetes, and the feeling of being denied because of their condition, particularly in social gatherings. Typical comments included: "I wish to eat meat to a point where I feel satisfied," "I feel like an orphan child denied things," and "During mango season I don't get to eat them, in addition to other things."

Lack of knowledge and misconceptions about diabetes complications in this sample (17) could serve as barriers to taking helpful actions. Only 12 of 29 patients knew that heart disease is related to diabetes; 16/29 patients pointed to elevated blood glucose as a complication. Symptoms such as dizziness, sluggishness, weakness, and increased urination were also seen as complications of diabetes. Over a third of patients (12/29) showed a lack of knowledge about and skills in dealing with dietary management of diabetes, and dissatisfaction

about education received from primary care, which could be a barrier for engaging in sound eating patterns. "All the materials I received from the health center are introductory and don't provide solutions to dealing with diabetes," "I don't know what to eat or not to eat," "I might go without food from morning until lunch or dinner time," and "I was given a one-day diet plan which was hard to follow, particularly in Ramadan".

Passive attitudes that may be seen as a form of denial or as a manifestation of fatalism [22] were apparent in a sizable number of patients (13). These informants did not accept that they were responsible for reducing their risk of developing diabetes complications. They believed that this was determined by their fate, which they could not alter. It is reasonable to conclude that this passive attitude originates from illiteracy and lack of knowledge, since their faith, Islam, does not promote passivity with regard to human health [23].

Finally, low self efficacy was seen as a barrier to following good diabetes management practices. For example, most patients (20) indicated that walking was recommended to them as a form of physical activity; however, 18 of them reported not complying with the recommendation (reasons mentioned below under "efficacy expectations." Overall, most patients indicated that the benefits of controlling diabetes outweighed the costs (23/29) but more patients placed emphasis on the short-term benefits of controlling diabetes (in order to feel better) than on the long-term health benefits (to avoid the complications).

Cues to action

The major cues to action for diabetes self-management in this group were their desire to feel better and their fear of complications (21/29). This can be seen in the following statements made by patients: "Nobody is unafraid of diseases," "I control my condition to feel better and not for anything else," and "I have to protect myself from getting more problems (complications)." Patients did not remark on any other reasons they considered strong enough to trigger them to take action to control their diabetes.

Efficacy expectations

Patients (24/29) reported being confident that family members would provide the necessary care if they fell and ill. They mostly perceived themselves (17/29) as having sufficient knowledge and skills to deal with diabetes management, even if they failed to comply. Walking was the main physical activity suggested (20/29) and showed up in statements like: "The doctor told me to walk every day, even for half an hour." However, they mostly (18/29) did not obey, giving reasons such as "I don't feel like it," "I have backache," "I have a busy schedule," "My knees hurt," and "It's hot; I can't walk." Dietary recommendations were perceived as difficult to follow: "It is not practical to tell someone don't eat such and such but eat such and such."

Use of traditional remedies

In this study group, 20/29 patients mentioned that their families had recommended the use of traditional remedies. These included unknown, pre-mixed bitter herbal drinks obtained from traditional healers. Other examples included homemade mixes of different blends such as fresh turmeric, thyme, and fenugreek. Some mentioned the use of bitter gourd (known as "Karela" in Oman, an Indian term), in

which the vegetable is sliced, boiled, then served as a dish or broth. The main reason cited for use of traditional medicines was the belief that the bitterness balanced the sugar in the body. Even so, half (10/20) of those who reported trying traditional medicines said they had stopped because: "I used them but didn't see a difference," "My liver didn't tolerate them," and "They might affect the kidneys and the pancreas."

Educational needs

Only half of the patients (15/29) perceived themselves as equipped with necessary information, while the other half made comments like: "There is no good education support." "All that they do is tell you that your sugar level is high and to be careful." "I was given a paper about diabetes and no more." "I was told to walk only." and, "They don't have much time to talk, very few times when that happened (advice was given)."

Notably, 19/29 patients did not actively seek information about diabetes, relying instead on what was given to them at the health services: "If information is provided, I listen." Those who were actively seeking information (7/29) turned to radio and television programs about diet and sharing experiences.

Only a third of participants (10/29) perceived education to be important as part of the support they could get from the PHC: "I want to know what to eat" and "Give me meal plans and suggestions that will not be tedious." A similar number of participants (12/29) perceived the services that they got from the PHC centers to be sufficient and did not value education as being very important.

Dietary recommendations mentioned by patients were largely (22/29) about cutting down and avoiding carbohydrates and fats. Rice/white bread (11/22), desserts (15/22), and fruits (7/22) were emphasized, for example: "Avoid mangoes, mango juice, and dates," "Avoid sweets and a lot of meat," and "Don't eat rice; eat brown bread." Reducing intake of sugary and starchy foods was a major recommendation of family members also. Nearly half (15/29) of patients were told to avoid these foods by their families: "Blood sugar is like a fuel gauge: the more you pump gas into your tank, the more it rises." Table 1 summarizes primary findings of patient interviews.

Discussion

The limitations of this study include its small geographical location: the Muscat Governorate of Oman; and the need for translation from Arabic to English, meaning that some nuances of the Omani dialect were possibly lost. Nevertheless this qualitative study throws light on the social determinants of the disease, laying the groundwork for culturally sensitive education/intervention efforts.

Using the HBM framework in the study explores the psychosocial factors relevant to understanding self-management behaviors in a sample of type 2 diabetes informants in Oman. Key outcomes are discussed here. The study was conducted in seven different PHC centers which allowed to account for different views of patients from separate locations.

Few subjects were conscious of the long-term benefits of diabetes management: maintaining their vision and contracting fewer diseases. Most patients acknowledged only the short-term benefits of diabetes management: low blood glucose, fewer body aches, and less polyuria. Even worse, incorrect information and misconceptions about diabetic complications among patients was frequent. They referred to symptoms of hyperglycemia as diabetic complications; they also mentioned liver disease and overweight as complications. Similar misconceptions were reported in Arab females with diabetes in Sweden, who confused the symptoms of diabetes with the consequences [11,24,25].

Subjects in the study did not view self blood glucose testing as important in managing diabetes. They had not been advised to test their blood glucose at home, which could explain the widespread lack of testing among patients, and why it was dismissed as unimportant. Teaching self blood glucose monitoring allows individuals to know how their blood glucose reacts to variations in diet, medication, and exercise, and they learn to distinguish between symptoms of hypo- and hyper-glycemia with regular home testing [26-28]. This important awareness is likely to heighten self-efficacy [29].

Several studies of nutritional education for people with type 2 diabetes have reported positive relationships between knowledge

Theme	Frequency	Participants' Responses
Susceptibility	16/29	Felt susceptible to diabetes complications
Severity	29	Complications have serious consequences
Benefits	20/29	Maintain health, feel healthy, be energized and remain free of symptoms (short term benefits)
Barriers	21/29	Lack of finances for self blood glucose testing
	16/29	Social interactions
	24/29	Emotional struggle
	12-17/29	Lack of knowledge and misconceptions
	13/29	Passivity and denial
	18/29	Low self-efficacy in physical activity
Cues to Action	21/29	Fear of complications and the desire to feel better
Efficacy expectations	17/29	Perceived having good knowledge and skills
	12/29	Perceived NOT having good knowledge and skills
	24/29	Family members will give care on days of illness
Traditional medications	20/29	Have received recommendations to use traditional remedies
Educational needs	15/29	Perceived to be empowered with necessary information for self-management
	14/29	Perceived to have NOT been empowered with necessary information pertinent to self-management
	19/29	Did not actively seek information about diabetes
	22/29	Been recommended to cut down and avoid carbohydrates and fats

Table 1: Summary of the Interview Findings of Patients with Type 2 Diabetes.

and metabolic control. As knowledge increased, patients were more likely to have better metabolic control [30-32]. In contrast, where patients lack knowledge, misconceptions can act as barriers to self-management. Poor knowledge, attitudes, and perceptions are likely to exacerbate symptoms of diabetes [33, 34]. The confusion in identifying symptoms and complications seen in this study has been reported elsewhere [11]. Suboptimal knowledge of diabetes risk factors, symptoms and complications was also seen among Omani adults in a recent community based study [35].

Sensible eating behaviors are hindered by cultural factors. Without good social support patients with diabetes are less likely to adhere to meal plans designed for controlling diabetes. The Omani culture is characterized by a strong social network. In such collective societies, family, relatives, and friends have a great influence on an individual's life [36]. A sense of social obligation forces people with diabetes to eat more food than is recommended. This finding concurs with that reported by Greenhalgh et al. [25] in a study of Bangladeshi Muslims living in the United Kingdom; Bangladeshi patients with type 2 diabetes commonly gave up their meal planning due to social obligations. Similar findings were noted elsewhere [37, 38]. Health education therefore should include information on how patients can successfully manage social commitments while maintaining appropriate meal plans, and stress the importance of doing so.

Omani patients unfortunately showed lack of knowledge about essential dietary habits. Two factors seem to shape Omani patients' dietary habits. One influence is the superficial health education information prescribed by the health professionals. The other influence comes from the social setting. In Oman, it has been noted that family tends to play a pivotal role in matters of health [39]. Eating behaviors are often related to the humoral health system, which owes its origin to ancient Greek medicine [40]. Such 'hot and cold' beliefs tend to be strongly rooted in dietary habits and such teachings are firmly ingrained in Omani people. For example, it is considered uncouth if something sweet is served to guests without being followed by coffee. According to the local conception of humoral diets, coffee is cold while sweets are hot. These two combinations are deemed to be synergetic. It is not known how such teachings, in tandem with modern affluence and widely available rich foods, act to further complicate emerging public health problems including the rising tide of diabetes. Omani patients need to be educated and empowered with approaches to control diabetes that fit with their personal, cultural and social customs and norms. More studies on this topic are therefore indicated.

To complicate the issue further, many Omani patients relegate diabetes education to a secondary role compared to medication. This suggests a wide-spread expectation that medication will provide a 'cure'. Abdelmoneim & Al-Homrany [41] have reported in similar Arab/Islamic populations that there is a strong tendency to perceive drugs or medication as having all of the answers to disease. Such cultural beliefs are likely to assign less importance to lifestyle and behavioral modifications than to prescribed drugs and medications. When the health educational services provided to them are perceived as poor, hard to follow, and insufficient, this attitude is only exacerbated.

The educational level of a patient is significant. The majority of the study's participants were literate, but their education had not gone beyond the secondary level. The moderating factor of education is obvious. For example, those with higher education did acknowledge the importance of health education in the management of diabetes. However, this group also perceived health education recommendations as incompatible with their social commitments and some were deemed too tedious to follow. An earlier study on Omani patients with type 2 diabetes also revealed that patients with diabetes were not satisfied with the type of health education given either by doctors or through printed materials [42].

Health education needs to attempt to improve diabetes patients' self-efficacy. Psychosocial studies have shown that variations in self-efficacy are invariably related to health outcomes [43]. High self-efficacy scores have been reported to be significantly and positively correlated with desired diabetes self-management behaviors. When patients with diabetes had higher self-efficacy scores, they were more likely to test their blood glucose, not to skip medications or engage in binge eating, and to adhere to a good diet. Further, it has been shown that there was a negative relationship between barriers and self-efficacy; patients perceiving fewer barriers were more confident in diabetes self-care behaviors [44]. The present study suggest that people with diabetes in Oman have low self-efficacy. Based on this construct, patients might believe that an action could benefit them, but they may not act accordingly to achieve the desired outcomes due to a low, or complete lack of confidence in executing the necessary actions [45]. Accordingly they lack initiative in regularly engaging in much needed exercise, monitoring blood glucose levels, and adhering to diet plans. Although a large number of participants in this study did perceive that lifestyle changes could moderate the progression of diabetes, most, due to lack of time and motivation, were less likely to adhere to those lifestyle changes. Thus, to increase self-efficacy in diabetes self-care behaviors, patients' barriers should be addressed by developing appropriate knowledge and skills. As external motivators may not be the best option for encouraging patients to adopt a lifestyle that contributes to coping successfully with diabetes, there are internal factors that could assist in effective health education. Most participants did recognize the adverse impact that diabetes can have on one's health, including debilitating and intransigent kidney diseases, and impaired vision. Such recognition acts as a trigger to capitalize on good, relevant health education, such a view is congruent with HBM [15].

A final area which requires an educational input is that of the use of traditional remedies. These are popular in many parts of the world [46, 47] and Oman is no exception [9]. Participants in this study had strong beliefs in traditional remedies, demonstrating that they are seeking solutions for their health condition. Such remedies have been reported in the literature among other groups of patients with type 2 diabetes [11, 26, 48]. Some traditional medicine has become mainstream while some are sold as food supplements [49]. Unlike modern medicine, which has a scientific basis, the conceptual framework of traditional medicine is rooted in socio-cultural teachings. On the other hand, the long training of modern doctors and their unique training in modern medicine has left its practitioners cut off from the very societies that they are supposed to understand, and to which they hope to provide health care. More studies are needed to understand the action properties of the active ingredients of such remedies and how can they effectively be incorporated within modern medicine to account for traditional practices rather than dismissing them as ineffective.

Conclusion

Oman bears a "double burden" as, on the one hand, the country is still suffering from health concerns that traditionally plague the developing world, including poor maternal health, and malnutrition. On the other hand, there has been a recent emergence of non-

communicable diseases, such as diabetes, that are strongly precipitated and exacerbated by an individual's behavior and life style. Psychosocial factors play an important role in managing the latter health burden. Thus it is important that such variables are taken into account when designing intervention and management programs in combating relevant conditions such as diabetes.

The present study, to our knowledge, is the first qualitative study to decipher individuals', in-depth insights concerning beliefs about and perspectives on diabetes and its complications among Omanis. As diabetes is progressive, but lifestyle changes could mitigate its expression, an understanding of the health beliefs associated with diabetes self-management among persons with type 2 diabetes in Oman would lay the groundwork for evidence-based, culturally specific health education, and create the basis for further study.

Although Oman has a national health care policy, self blood glucose testing is likely to be perceived as a financial burden as it is not subsidized by the government. People are used to receiving health services at no cost. Patients may hold the belief that, if self blood glucose monitoring were important, it would be provided at no cost to them by the government. It seems appropriate to recommend subsidization of the cost of self blood glucose monitoring for economically disadvantaged patients.

Competing Interests

The authors declare that they have no competing interests.

Author Contributions

- Lyutha Al Subhi: had the substantial contributions to conception and design, acquisition of data, analysis and interpretation of data.
- Patricia Kendall: had the substantial contributions to conception and design, analysis and interpretation of data, and revising the manuscript critically.
- Mohammed Al-Shafaee: involved in revising the manuscript critically for intellectual content.
- Samir Al-Adawi: involved in revising the manuscript critically for intellectual content.

References

1. Shaw JE, Sicree RA, Zimmet PZ (2010) Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Res Clin Pract 87: 4-14.

2. Al-Moosa S, Allin S, Jemiai N, Al-Lawati J, Mossialos E (2006) Diabetes and urbanization in the Omani population: an analysis of national survey data. Popul Health Metr 4: 5.

3. Liu YM, Hsieh CR (2012) New drugs and the growth of health expenditure: evidence from diabetic patients in Taiwan. Health Econ 21: 496-513.

4. Asfour MG, Samantray SK, Dua A, King H (1991) Diabetes mellitus in the sultanate of Oman. Diabet Med 8: 76-80.

5. Asfour MG, Lambourne A, Soliman A, Al-Behlani S, Al-Asfoor D et al., (1995) High prevalence of diabetes mellitus and impaired glucose tolerance in the Sultanate of Oman: results of the 1991 national survey. Diabet Med 12: 1122-1125.

6. Al-Lawati JA, Al Riyami AM, Mohammed AJ, Jousilahti P (2002) Increasing prevalence of diabetes mellitus in Oman. Diabet Med 19: 954-957.

7. International Diabetes Federation (2005) Clinical Guidlines Task Force. Global Guideline for Type 2 Diabetes.

8. Al-Adawi S (2006) Emergence of Diseases of Affluence in Oman: Where do they Feature in the Health Research Agenda? Sultan Qaboos University Medical J 6: 3-9.

9. Al-Kindi RM, Al-Mushrafi M, Al-Rabaani M, Al-Zakwani I (2011) Complementary and Alternative Medicine Use among Adults with Diabetes in Muscat Region, Oman. Sultan Qaboos Univ Med J 11: 62-68.

10. Wang C, Chan SMA (2005) Culturally tailored diabetes education program for Chinese Americans. Nurs Res 54: 347-53.

11. Hjelm K, Bard K, Nyberg P, Apelqvist J (2003) Religious and cultural distance in beliefs about health and illness in women with diabetes mellitus of different origin living in Sweden. Int J Nurs Stud 40:627-643.

12. Al Kawas S, Ghazzi HA, Suliman N (2011) Knowledge and oral health awareness about diabetes among college population in United Arab Emirates: A pilot study. World J Med Sci 6: 1-5.

13. Jazayeri SMHM, Pipelzadeh MH (2006) Barriers to diet self-care in outpatients with type 2 diabetes in Iran. Pakistan J Med Sci 22: 412-415.

14. Kartal A, Ozsoy SA (2007) Validity and reliability study of the Turkish version of Health Belief Model Scale in diabetic patients. Int J Nurs Stud 44: 1447-1458.

15. Glanz K, Rimer BK, Lewis FM (2002) Health Behavior and Health Education: Theory, Research, and Practice. Jossey-Bass Inc.

16. Noar SM, Mehrotra P (2011) Toward a new methodological paradigm for testing theories of health behavior and health behavior change. Patient Educ Couns 82: 468-474.

17. Glanz K, Bishop DB (2010) The role of behavioral science theory in development and implementation of public health interventions. Annu Rev Public Health 31: 399-418.

18. Brown JB, Harris SB, Webster-Bogaert S, Wetmore S, Faulds C, et al. (2002) The role of patient, physician and systemic factors in the management of type 2 diabetes mellitus. Fam Pract 19: 344-349.

19. Wdowik MJ (1998) College Students with Diabetes: Predictors of Diabetes Management and Development of an Intervention. Doctoral dissertation, in Department of Food Science and Human Nutrition. Colorado State University: Fort Collins.

20. Carley K (1993) Coding choices for textual analysis: A comparison of content analysis and map analysis. Socio Method 23: 75-126.

21. Morgan DL (1993) Qualitative content analysis: a guide to paths not taken. Qual Health Res 3: 112-121.

22. Hamdy SF, Fatalism I (2009) Medical Intervention: Lessons from Egypt on the Cultivation of Forbearance (Sabr) and Reliance on God (Tawakkul). Anthropol Quar 82: 173-196.

23. Abudawud SS, Dawud SA (1995) Cairo: Mustafaa al-Baaby 4.

24. Brown SA, Hanis CL (1999) Culturally competent diabetes education for Mexican Americans: the Starr County Study. Diabetes Educ 25: 226-236.

25. Greenhalgh T, Helman C, Chowdhury AM (1998) Health beliefs and folk models of diabetes in British Bangladeshis: a qualitative study. BMJ 316: 978-983.

26. Brown SA, Upchurch SL, Garcia AA, Barton SA, Hanis CL (1998) Symptom-related self-care of Mexican Americans with type 2 diabetes: preliminary findings of the Starr County Diabetes Education Study. Diabetes Educ 24: 331-339.

27. García AA (2011) The Diabetes Symptom Self-Care Inventory: development and psychometric testing with Mexican Americans. J Pain Symptom Manage 41: 715-727.

28. Whittemore R, Melkus GD, Grey M (2004) Applying the social ecological theory to type 2 diabetes prevention and management. J Community Health Nurs 21: 87-99.

29. Skinner TC, Hampson SE (2001) Personal models of diabetes in relation to self-care, well-being, and glycemic control. A prospective study in adolescence. Diabetes Care 24: 828-833.

30. Adolfsson ET, Walker-Engström ML, Smide B, Wikblad K (2007) Patient education in type 2 diabetes: a randomized controlled 1-year follow-up study. Diabetes Res Clin Pract 76: 341-350.

31. Chodosh J, Morton SC, Mojica W, Maglione M, Suttorp MJ, et al. (2005) Meta-analysis: chronic disease self-management programs for older adults. Ann Intern Med 143: 427-438.

32. Panja S, Starr B, Colleran KM (2005) Patient knowledge improves glycemic control: is it time to go back to the classroom? J Investig Med 53: 264-266.

33. Abdullah L, Margolis S, Townsend T (2001) Primary health care patients' knowledge about diabetes in the United Arab Emirates. East Mediterr Health J 7: 662-670.

34. Grace C, Begum R, Subhani S, Kopelman P, Greenhalgh T (2008) Prevention of type 2 diabetes in British Bangladeshis: qualitative study of community, religious, and professional perspectives. BMJ 337: a1931.

35. Al Shafaee MA, Al-Shukaili S, Rizvi SG, Al Farsi Y, Khan MA, et al. (2008) Knowledge and perceptions of diabetes in a semi-urban Omani population. BMC Public Health 8: 249.

36. Al-Adawi S (2006) Adolescence in Oman, in International Encyclopedia of Adolescence: A Historical and Cultural Survey of Young People around the World. JJ Arnett USA.

37. Kohinor MJ, Stronks K, Nicolaou M, Haafkens JA (2011) Considerations affecting dietary behaviour of immigrants with type 2 diabetes: a qualitative study among Surinamese in the Netherlands. Ethn Health 16: 245-258.

38. Peeters B, Van Tongelen I, Boussery K, Mehuys E, Remon JP, et al., (2011) Factors associated with medication adherence to oral hypoglycaemic agents in different ethnic groups suffering from Type2 diabetes: A systematic literature review and suggestions for further research. Diabet Med 28: 262-275.

39. Al-Mandhari A, Al-Adawi S, Al-Zakwani I, Al-Shafaee M, Eloul L (2009) Relatives' advice and health care-seeking behaviour in oman. Sultan Qaboos Univ Med J 9: 264-271.

40. Hammad A (1999) Guide to Arab culture: Health care delivery to the Arab American community. Arab Community Center for Economic and Social Services Community Health Center, Health Research Unit: Dearborn 30.

41. Abdelmoneim I, Al-Homrany MA (2002) Health education in the management of diabetes at the primary health care level: is there a gender difference? East Mediterr Health J 8: 18-23.

42. Abdulhadi N, Al Shafaee M, Freudenthal S, Ostenson CG, Wahlström R (2007) Patient-provider interaction from the perspectives of type 2 diabetes patients in Muscat, Oman: a qualitative study. BMC Health Serv Res 7: 162.

43. Hawthorne K, Robles Y, Cannings-John R, Edwards AG (2008) Culturally appropriate health education for type 2 diabetes mellitus in ethnic minority groups. Cochrane Database Syst Rev : CD006424.

44. Aljasem LI, Peyrot M, Wissow L, Rubin RR (2001) The impact of barriers and self-efficacy on self-care behaviors in type 2 diabetes. Diabetes Educ 27: 393-404.

45. Bandura A (1977) Self-efficacy: toward a unifying theory of behavioral change. Psychol Rev 84: 191-215.

46. Hasan SS, See CK, Choong CL, Ahmed SI, Ahmadi K, et al. (2010) Reasons, perceived efficacy, and factors associated with complementary and alternative medicine use among Malaysian patients with HIV/AIDS. J Altern Complement Med 16: 1171-1176.

47. Wazaify M, Afifi FU, El-Khateeb M, Ajlouni K (2011) Complementary and alternative medicine use among Jordanian patients with diabetes. Complement Ther Clin Pract 17: 71-75.

48. Nthangeni G, Steyn NP, Alberts M, Steyn K, Levitt NS, et al. (2002) Dietary intake and barriers to dietary compliance in black type 2 diabetic patients attending primary health-care services. Public Health Nutr 5: 329-338.

49. Hasani-Ranjbar S, Nayebi N, Larijani B, Abdollahi M (2009) A systematic review of the efficacy and safety of herbal medicines used in the treatment of obesity. World J Gastroenterol 15: 3073-3085.